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ABSTRACT

Computer technology has nearly infinite potential for expanding the minds of children. However, at present a great discrepancy exists between what this tool for the mind is capable of doing and what child care centers, schools, and society allow it to do. Two computer-related activities that may be implemented with very young children are (1) developing programing abilities and (2) using word processing computer systems to develop writing abilities. Although prior to 1980 interactive programing was largely inaccessible to adults as well as children, researchers using languages such as Papert's LOGO now demonstrate that computers are a medium through which children can be generators of information rather than merely recipients. Word processing appears to have a great deal of promise for supporting a shift in the teaching of writing toward an emphasis on prewriting, composing, and rewriting (three major processes used by effective writers). While the educational potential for computer use is gaining widespread support, a number of serious drawbacks associated with this technology need to be addressed by early childhood educators; such drawbacks include an absence of supportive research, the poor quality of software programs, fear of computers, and lack of computer literacy among early childhood personnel. (RH)

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COMPUTERS AND VERY YOUNG CHILDREN: EDUCATIONAL PROMISE AND PROBLEMS

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RUNNING HEAD: COMPUTERS AND VERY YOUNG CHILDREN

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MICROCOMPUTERS AND VERY YOUNG CHILDREN:

EDUCATIONAL PROMISE AND PROBLEMS

As many of us grew up in the 1950's and 1960's, our knowledge of computers was restricted to cartoons of "mad scientists" pushing a barage of buttons in a room filled with strange sounds and devices. While industry has made increasing use of computer technology since the 1950's, it was not until the introduction of the silicon chip microprocessing unit in the early 1970's that computers came into the financial reach of many families. While this very article is being written, major computer companies have announced tremendous price reductions for the coming year. Radio Shack, for example, dropped the price of its TRS-80 from $399.00 in 1982 to $301.00 for 1983. Texas Instruments announced that its TI-99/4A which listed at $299.00 last year would be accompanied by a $100.00 rebate. (A model similar to this sold for $1,000.00 the year before.) Finally, Timex now offers its Timex Sinclair 1000 for only $99.00 (Greenwald, 1982).

The microprocessor, a technological advancement which is the heart of computers and unheard of only a decade ago, has now inundated our daily lives (e.g., microwaves, grocery stores, hospitals, calculators, telephones, cameras). A problem emerges when one considers that my vision of the "mad scientist" feverishly operating a computing machine is now replaced by my three-year-old daughter, with tongue in motion, carefully operating the control stick of a

home computer. Computers are destined to consume increasing amounts of younger children's precious moments. Yet, nearly nothing is known about the effects and potential of what Papert (1980) has termed the "computer culture" upon the development of very young children.

Educational Promise of Computer Technology and Young Children

Computer technology has nearly infinite potential for expanding the minds of children. Yet, at present there is great discrepancy between what this tool for the mind is capable of doing and what child care centers, schools, and society allow it to do. Computers have, since their widespread introduction to the business world only 20 years ago, been used primarily to increase speed, efficiency, and especially profits. The rapidly diminishing expense involved in purchasing computers has now moved thinking toward non-profit educational possibilities of computer use. Two mind-expanding pursuits which appear most promising with very young children are (1) developing child-programmers and (2) using word processing computer systems to develop writing abilities.

Children as Programmers

When a colleague adjured me to consider computer use with my kindergarten class a few years ago, my reaction was one of aversion. This response was an outgrowth of my observations of

computer programs which were (and still are for the most part) little more than workbooks on a T.V. screen. In such computer-child interactions children are programmed by the computers. The major reason why computer programs developed in this passive manner was that prior to 1980, available computer languages from business and sciences (e.g. COBOL, FORTRAN) kept interactive programming out of reach of most adults, let alone children.

Recognizing the tremendous potential computers hold as an "object-to-think-with," Seymore Papert (who studied with Piaget for five years and based his work primarily on Piagetan theory) developed a computer language especially for children. This system is an interactive language which makes special use of a metaphorral "turtle" which is easily controlled by the very young user. Papert states:

> The turtle is a computer-controlled cybernetic animal. It exists within the cognitive mini-cultures of the 'LOGO environment,' LOGO being the computer language in which communication with the Turtle takes place. The Turtle serves no other purpose than of being good to program and good to think with. (Papert, 1980, p. 11)

After being introduced to the turtle on the computer screen, the instructor shows how the animal can be controlled by typing commands in his language (e.g. FORWARD 10 makes the turtle move

ahead 10 steps). Once children become comfortable with the idea of an animal on the screen, programming is introduced as a method of teaching the turtle a "new word." Soon, the child programs the turtle to respond to commands invented by the child (e.g. "SQ" may stand for the command "make a square"). Later children are shown how music can be programmed into the computer and they can then make the turtle "dance" to the music they create. By programming the computer, Papert (1980) suggests the child:

> ... both acquires a sense of mastery over a piece of the most modern and powerful technology and establishes an intimate contact with some of the deepest ideas from science, from mathematics, and from the art of intellectual building. (Papert, 1980, p. 5)

Using languages such as LOGO, researchers are beginning to demonstrate that the computer now has the potential for allowing children to become GENERATORS rather than only consumers of information. Emerging research has demonstrated that young children (ages 6-11) are indeed capable of programming computers (Doorly, 1980, Papert, 1978, 1980). Encouraging results in studies with older children has spurred current interest in programming abilities of even younger children (Ninemire, in progress).

Computers as Vehicles for Improving Writing Abilities

There has been a great deal of interest in the area of writing and the very young child over the past couple of years. Part of the impetus for concern in this area is public sentiment spurred by information such as the most recent National Assessment of Educational Progress (NAEP, 1981) which strongly indicts American schools for not producing students with proficiency in the thought/communication aspects of writing. In an attempt to improve writing instruction, researchers have suggested that a major shift needs to be initiated in educational programs to move the focus of writing away from handwriting and technical skills toward an emphasis upon the process used by proficient writers.

An extensive review of the research on children's writing by Vukelich (1981) concluded that effective writers engage in three major processes: (1) prewriting, which involves preparation for writing and includes thinking through the task at hand (2) composing, which involves the actual writing as well as making decisions about what goes where, stopping and starting, and rereading, and (3) rewriting, which involves altering, clarifying, and refining ideas. The latter skill of good writers, "rewriting", has been given special attention in the past couple of years. Goodman (1980) conducted extensive research which suggests that we should rapidly move away from an emphasis upon

mechanics of writing toward getting students involved in writing as a communication process. One suggestion for achieving this goal is for teachers to become what she terms "kid watchers" and keep records of MISTAKES that children make in writing in order to guide further decisions. Graves (1981) also explored the importance of "mistakes" in the writing process and has concluded that mistakes are actually an indication of a child's "intellectual progress." From a research perspective, teachers who teach writing by stressing only the mechanics of writing rather than structure an environment conducive to development of the three major processes of written communication, do a disservice to their students.

Given the present conditions of writing instruction in the schools, prospects for improving writing are poor unless new approaches which take into account recent data are developed. One such approach is made possible by a "word processor" microcomputer program. This package allows students to type stories into the computer. After putting the story into the computer's memory through a simple keyboard manipulation, the ideas can be easily revised, i.e., words/sentences can be inserted, erased, moved in any direction, and stored for later revisions. Programs are available which automatically correct misspelled words and grammatical errors. (Programs are now being developed which allow misspelled words to go into a file for individualized spelling words.) When the child is finally happy with the work,

the computer can rapidly print out a polished copy with book margins. Word processing appears especially ideal for developing the process of rewriting by alleviating the technical drudgery of writing (erasing, drill on letter formation, re-copying) thereby, freeing time which can be devoted to the improvement of creative and analytical thought processes.

Word processing appears to have a great deal of promise for supporting the shift in teaching of writing toward an emphasis on pre-writing, writing, and rewriting. A recent report entitled, "Huge Potential Seen in Largely Undeveloped Field: Sophisticated Microcomputers Used to Teach Students to Write" indicated that:

> Microcomputers when programmed as word processors--which require typing and analytical skills of a student rather than the simple ability to respond with a yes or no answer to questions on the computer screen--are a potential boon to students' writing and thinking skills. (Toch, 1982, p. 13)

In October, 1981, the U.S. Department of Education recognized the word processor's potential by providing funding for its further development in educational settings (Heard, 1982).

Finally, evaluative data recently reported by DiGiammario (1981) indicates that positive benefits result from use of a word processing program at the early elementary school level. His findings suggest that elementary students using the word processor revise their work more, they are less fearful of having to produce new copy, they write longer stories, follow directions, and pay more attention to detail.

Educational Problems of Computer Technology and Young Children

Under the supervision of a teacher knowledgeable in child development and basic computer literacy (the latter can be accomplished by participating in as few as one or two workshops to get you started) computer technology has much potential for expanding communication and intellectual abilities of young children. Shane (1982) has heralded the computer as the fourth major "communication revolution" in the history of our species (complex speech, writing and the Gutenberg press are the first three). This revolution is rapidly moving into the educational lives of increasingly younger children. In the fall of 1982, for example, IBM placed 300 of its personal computers into classrooms of 10,000 kindergarten and first grade students. (Education Week, August 25, 1982). Even child care centers are taking advantage of the computer bandwagon by using computers in their curricula and advertisements. While the educational potential for

computer use is gaining widespread support, a number of serious drawbacks associated with this technology need to be addressed by early childhood educators.

Research Void

Arthur Melmed, an advisor with the National Institute of Education, recently suggested that if the monumental educational potential of computers is to be realized, "...some hard evidence supporting the value of such instruction..." is urgently needed (Melmed, 1982, p. 310). While a body of data tending to support computer use by secondary and upper-elementary students has begun to emerge after the past half-decade, nearly nothing is now known about the effects of computer technology upon preschool children. A recent search of the ERIC system for data relating to computers and young children revealed only one document (Perlman, 1974). In spite of a dearth of data, computer use continues its epidemic growth in the lives of our children.

Poor Quality Software Programs

While microcomputers themselves are in their infancy in terms of educational uses, software (the programs which run computers) are in their educational prenatal stage. The majority of currently available computer programs for young children are little more than untested workbooks on the screen.

Computer software is developed by people and marketed by companies in business to turn a profit. In terms of software development, however, even major companies readily admit problems with the products they are selling for use by children. Ernest Marx, for example, who is the head of a leading software company, recently reported "There are no real experts among publishing companies" and "no precedents to follow." Yet, in spite of such haphazard, untested, products, Marx's company (Miliken Publishing Company) "doubled its profits in each of the last three years" (Heard, 1982, p. 16).

The Educational Products Information Exchange recently completed an evaluation of software packages currently on the market and determined that the majority of programs were of a drill nature (95% were arithmetic programs). In addition, the reports indicated that programs which took advantage of the computer's potential for developing higher-order thinking processes were conspicuously absent (EPIE, 1981).

Unless more people with an understanding of child growth and development, learning theory, and computer technology begin to contribute to software development in our field, microcomputers will do little more than accelerate the proliferation of inadequate and inappropriate educational materials for young children.

Computers and Early Childhood Teachers

Early Childhood teachers serve a major role in developing the interests of young children. Yet, at present, the majority of us are computer illiterate. Our children have grown up with the computer culture and are generally very comfortable with the devices. The reverence for computers held by adults, however, often results in a condition recently described in the lay literature (Davis, 1982) and news media (CBS Evening News, September 24, 1982) as "cyberphobia." This condition characterizes one with an unrealistic fear or nervousness caused by computers.

Cyberphobia can be readily identified in speaking to teachers of young children who, without any understanding of computers, describe them as "just another fad" which will be gone next year. Further inquiry often leads teachers to admit they are indeed "afraid" of the awesome technology. A very competent Kindergarten teacher recently expressed her discomfort with computers in admitting a very common teacher fear, "What if it knows more than me?"

If cyberphobia is to be eliminated as a major obstacle in developing computer literate children, a number of changes appear most productive. First of all, teacher training institutions could meet the computer literacy demand by either integrating computer literacy into existing coursework or offer special classes such as "Microcomputers in the Classroom" which was recently

developed at North Texas State University (Bane, 1982). This course which is offered at both the undergraduate and graduate level is designed to introduce teachers to basic classroom applications of computers. Unless teachers become comfortable and begin to understand this developing technology, this mind tool is most unlikely to reach its potential as a learning rather than simple entertainment tool.

Conclusion

The question "should computers be used in the classroom" which was often debated only ten years ago is now moot. A recent report stated that in 1980 35,000 microcomputers were shipped to specialized computer stores for sale. This year 3,500,000 have been shipped for sale in nearly every type of store imaginable (Greenwald, 1982). Computers are and will continue to be a major element in the lives of young children. The problem which now arises is how to use computer technology to enrich those lives.

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